DOCUMENT RESUME

ED 087 422 IR 000 166

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TITLE Three Evaluation Reports of Computer Assisted Instruction in Drill-And-Practice Mathematics.
INSTITUTION Los Angeles County Superintendent of Schools, Calif.
PUB DATE Apr 73
NOTE 22p.; Paper presented at the Association for Educational Data Systems Annual Convention (New Orleans, Louisiana, April 16 through 19, 1973)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Academic Achievement; *Computer Assisted Instruction; Diagnostic Teaching; Diagnostic Tests; Educational Diagnosis; Elementary Grades; *Elementary School Mathematics; Individualized Instruction; Individualized Programs; *Mathematics Instruction; *Program Evaluation
IDENTIFIERS AEDS; Association for Educational Data Systems; California Arithmetic Test; California Test of Basic Skills; CAT; CTBS; Drill and Practice; Los Angeles County

ABSTRACT

Three separate evaluations of a computer-assisted instructional (CAI) drill and practice program were conducted. The CAI was provided by the Los Angeles County Superintendent to 14 districts as a means of improving students' math abilities and to help teachers manage diagnostic and prescriptive information. The California Test of Basic Skills (CTBS) and the California Arithmetic Test (CAT) were administered before and after instruction to both experimental (i.e., CAI) and control groups. In general, the results indicated that: 1) the mean post-test scores for the experimental groups exceeded those of the control groups; 2) a higher percentage of experimental than of control students exceeded their expected growth rates for the period; and 3) the students receiving CAI experienced growth rates substantially beyond normal expectations. Control group students performed better on tests of reasoning ability, perhaps because the CAI did not stress this skill. Since the program was of moderate cost, promoted student learning, reduced the teacher's remedial work and aided in diagnosis and prescription of student academic needs, it was recommended that it be expanded. (PB)

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THREE EVALUATION REPORTS OF

COMPUTER ASSISTED INSTRUCTION IN DRILL-AND-PRACTICE MATHEMATICS

Henry Palmer

Los Angeles County Schools

FIRST REPORT

The Office of the Los Angeles County Superintendent of Schools provides leadership and coordination for improvement of educational programs in 95 California School Districts. As one of its many supportive services the County Superintendent is presently providing Computer Assisted Instruction, Drill-and-Practice Mathematics to fourteen school sites in Los Angeles County. The goal of this program is to improve the mathematical ability of all students involved with the Computer Assisted Instruction Program and to provide diagnostic and prescriptive management information for classroom teachers.

DESCRIPTION OF PROGRAM

The program in operation is the Strands Drill-and-Practice in Elementary Mathematics marketed by the Computer Curriculum Corporation of Palo Alto, California. The program is based in a computer located in the Office of the Los Angeles County Superintendent of Schools. Users are connected by a dial-up or hardware telephone system with a teletype terminal interface. Students at each school site attend the terminal for 5 to 10 minute periods during each school day, receiving a series of problems in computation tailored to the student's functional level. Each terminal services up to 50 students each day.

The content in mathematics, grades 1-6, have been classified in the following 14 major areas called "Strands."*

* Handbook for Computer-Assisted Instruction in Elementary Mathematics, Grades 1 Through 6, Computer Curriculum Corporation, 1971

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Strand	Notation	Description
1.	(NC)	Number Concepts -- counting, place value, number theory.
2.	(VA)	Vertical Addition.
3.	(HA)	Horizontal Addition.
4.	(VS)	Vertical Subtraction.
5.	(HS)	Horizontal Subtraction.
6.	(FR)	Fractions.
7.	(EQ)	Equations.
8.	(HM)	Horizontal Multiplication.
9.	(VM)	Vertical Multiplication.
10.	(MS)	Units of Measure.
11.	(DV)	Long Division.
12.	(LW)	Laws of Arithmetic.
13.	(DC)	Decimals.
14.	(NG)	Negative Numbers.

The computer provides each student with a mix of Strands during each lesson, then scores each Strand and updates the student's performance profile. During the first month of use, seven hundred students spaces were assigned with the average daily usage by 620 students.

During the operation period the students averaged about 60 lessons, or about 1 lesson per day. Some schools, by design, allowed each student only a few weeks experience at the terminal, and they in turn were then replaced by other students who also received the same limited experience with the computer lessons. The computer program and hardware were under continuous improvement at the start of our project with minimal down-time to interrupt student lessons.

INSERVICE

Two meetings were held with prospective users before the start of the program to provide them with basic information for the system operation and management. Also, the decision was made to acquire (and distribute to users), a Cross-Reference Guide which relates each concept back to specific pages of the basic state adopted textbooks. This provided for improved individualization of the program. Each participating site was visited in an extension of the user orientation program.

EVALUATION

Leadership in planning the evaluation of individual district programs was entrusted to district personnel. Several management designs emerged. One noteworthy example was the work done at Washington Elementary School in Pasadena, directed by Mr. Norm Bates.

ACHIEVEMENT TEST DATA

In this particular case the California Test of Basic Skills (C.T.B.S.) was given to five groups of students in a pre-test, post-test experimental design with one control class. As Table 1 indicates, at the end of about four months each of the experimental classes showed a higher average gain than the control class, with the main gains for experimental classes 20 and 21 being statistically significant from that of the control class. This trend, for the experimental classes to evidence higher mean gains, is also reflected in the Fundamentals subtest of the California Arithmetic Test (CAT). Although the differences are not statistically significant, again, the mean gain for the experimental classes are greater than the mean gain for the control class. The results of the Reasoning Subtest of the CAT indicates the control class showed a greater mean gain than the experimental classes. The differences were not significant except for the difference between class 22 and the control class, with the experimental class showing a decrease in reasoning ability as measured by this subtest. A partial explanation for the greater mean gain by the control class may be in the nature of the instructional content of the 2 methods. The CAI technique emphasizes drill and practice more than reasoning; whereas the "traditional" technique entails more practice in reasoning. The evidence for this conclusion has been presented previously when discussing the Fundamentals subtest. In this case, the experimental classes showed the greater mean gain; indicating a greater emphasis in the areas of drill and practice for the CAI technique.

Tables 2a - 2d show the frequency distributions of gain scores for the experimental and control classes. Table 2a indicates that more experimental subjects (83.3%) than control subjects (75%) equalled or surpassed the expected growth rate of four months on the CTBS. The data of Table 2b indicate that more control subjects (62.5%) than experimental subjects (52.5%) equalled or surpassed the expected growth. The results of Table 2c show that more experimental subjects (72.5%) than control subjects (50%) equalled or exceeded the growth rate. Table 2d summarizes the overall average change for the two groups. Again, the evidence indicates that 70% experimental classes improved at or greater than the expected rate, whereas only 50% of the control class showed this rate of growth. The results of tables 2b and 2c re-emphasize the conclusion stated earlier concerning the differential effect CAI has on learning. It is a result which would seem to indicate further research is warranted to see if this difference in reasoning and fundamental growth is a true difference or an artifact of the experiment.

ATTITUDINAL MEASUREMENT

All teachers and students involved in using the program were surveyed. The overall attitude expressed was very positive as can be noted by the percentage response to using the program the next year in other administrative

	POSITIVE	UNDECIDED	NEGATIVE
Item #8*	91%	9%	0%
Item #15**	76%	11%	13%

and supervisory personnel in participating school districts feel very positive about this Computer Assisted Mathematics Program (Item #15).

COST

Total cost for 4 months operation of the program was $13,296.00, which is about $3,400.00 per month, or an average cost of $5.50 per student per month. This cost factor can be reduced by more than 50% since twice the present number of students can use the system for the same cost.

SECOND REPORT

A second noteworthy example is presently going on at Mary E. Bragg School in Los Angeles County.*** The children whose regular mathematics program is being supplemented by Computer Assisted Instruction Drill-and-Practice showed impressive gains based on a five weeks study period using the California Test of Basic Skills (C.T.B.S.) tests. They were tested in October, 1972 and again in February, 1973. Thirty-six fourth graders and 36 fifth graders participated. These students were regrouped by ability levels at the beginning of the school year. In each case above average students are involved.

Test results - 4th grade

Average growth in years and months for the class

Skills	Growth
Computation	9 months
Concepts	2 years 3 months
Application	1 year 3 months
Total for Test	1 year 4 months

* Item 8. I want to continue using CAI next year.

** Item 15. The administration and supervisory personnel of my school district have a very favorable attitude toward the CAI program.

*** Full Report from Mary E. Bragg School submitted to the Office of the Los Angeles County Superintendent of Schools in March, 1973. Test Data is given in Tables 3 and 4.

Test results - 5th grade

Average growth in years and months for the class

Skills	Growth
Computation	9 months
Concepts	6 months
Application	7 months
Total for Test	7 months

Some Observations Made by School Personnel

1. The 40 minutes computation section of the test was completed by all students in 12 minutes.
2. Need for the teachers to repeat and drill in certain areas is reduced considerably.
3. Student interest in mathematics is increasing.
4. Need to upgrade math program is very apparent for these students. Many of these students are now working in various advanced concepts.
5. Fourth grade completed concepts work in December.
6. Fifth grade started in January and will complete work in March.

Recommendations

1. Continue with use of computer.
2. Place students on computer whose achievement falls below average.
3. Concentrate math instruction in basic areas of addition, subtraction, multiplication and division.
4. Provide more terminals to involve more students.

THIRD REPORT

A third outstanding example is the program at the Will Rogers School.* This study was made in two one month periods. The first period began on 2 November, 1972 and lasted through 1 December. The second period began on 3 January, 1973 and ended on 31 January.

Findings for the November-December Period

On 2 November 59 students were selected who had each worked an average of 9.34 sessions on the computer.

* Full Report written by Al Cremens and Orr Kinman submitted to the Office of the Los Angeles County Superintendent of Schools in March, 1973. Test Data is given in Tables 5 through 10.

On 1 December each student had worked an average of 13.3 additional sessions. The most typical achievement gain for this period was 2 months. The second most typical gain was 3 months. Seven made less than one month progress. (See Tables 5 and 6). The gains ranged from minus 4 months to plus 14 months. Because of the lack of standard scores in the computer reports, an exact average gain per pupil is not possible to compute.

All three teachers who have students in the program were extremely enthusiastic about the results during this period and the potential for the future. The teachers made the following indications:

1. They felt it helps them determine the kind of problems individual students are encountering and makes it possible to individualize math work on a day-to-day basis.

2. They felt that the computer program is more than drill, and that much teaching takes place as students see the errors of their work as they proceed through a session.

3. They felt that students learn to work and think more quickly because of the timing element of the computer.

Findings for the January Period

The second study of those children still using the computer terminal between the period of 3 January and 31 January was made. Out of the original 59 students, 53 were still on the terminal. The most typical achievement gain during this period was one month, and the second most typical gain was 3 months. During this period, only 3 children made no gains while only 18 out of the 53 made less than two months gain. The average number of sessions on the terminal per student for this month was 14 sessions. (See Tables 7 and 8).

Findings for the November-January Period

In looking at the overall period between 2 November and 31 January, a period of 48 school days, or 2.4 months, it is interesting to note that there are two modes of peaks within the group. Eight students showed an achievement gain of 5 months and 8 students showed an achievement gain of 9 months. The median, or mid-point of the group was at the 7th month achievement gain. Only 7 students out of the group of 53 made less than 3 months achievement gain. (See Tables 9 and 10).

Costs

The cost for the use of the terminal is $350 per month. This theoretically provides for 60 students per day. However, in actual practice an average of 47 students per day use the machine.

In computing the cost per student per month of achievement gain in math computational skills the following statements can be made:

1. The cost per student per month based on 60 students per day is $5.83 per student.

2. If we assume that the most typical achievement gain is two months per month of service, then the cost per student per month of achievement gain is $2.92.

3. If we assume that the most typical achievement gain is 3 months per month of service, then the cost per student per month of achievement gain is $1.94.

4. The data from this study suggests that most of the students in the study made at least 2 months achievement gain per month of service, and many did better. (See Table 9).

Other Considerations

In evaluating the overall program with the teachers, one of the problems they noted is the distraction caused by children going in and out of the room and the necessity of keeping track to make sure that the computer terminal is constantly in use.

Another important aspect of the program is the follow-up work that needs to be done after the child comes off the computer terminal. In talking with both teachers and children, it is felt that there is a real need for immediate follow-up of the work sheet. Going over the problems the child missed, or did not understand; explaining the meaning of his score; and making sure that parents get some feed-back concerning the use of the computer and the progress being made.

In discussing the program with the children, it was felt that their motivation depends on how much success they have been having on the computer, and how much follow-up work is done in the classroom. Those few students who are no longer interested in working on the computer terminal appear to be the ones who are having the most difficulty.

The results of this study suggest that this is a worthwhile program in helping students improve their computational skills. And that consideration should be made for the Title I project to invest more money in more terminals to serve more students in 1973-74.

CONSIDERATIONS FOR THE FUTURE

Reports received from all participating districts specifically state that the CAI Mathematics Drill-and-Practice is a highly desirable and necessary supplement to their existing mathematics program.

The Office of the Los Angeles County Superintendent of Schools is now trying to do two things:

1. Reduce the cost of the program to districts and
2. Expand the program; its content and its use, so that more children can benefit.

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TABLE 1

TABULATION OF COMPUTER-ASSISTED INSTRUCTION IN DRILL-AND-PRACTICE MATHEMATICS ON MEAN, STANDARD DEVIATION AND t TEST

	CALIFORNIA ARITHMETIC TEST												CTBS			
	REASONING				FUNDAMENTAL				TOTAL AVERAGE							
CLASS	N	MEAN	S.D.	t	N	MEAN	S.D.	t	N	MEAN	S.D.	t	N	MEAN	S.D.	t
EXP-20	12	.46	.68	-.456	12	.63	.63	1.301	12	.59	.38	.945	12	1.15	.51	2.738*
EXP-21	11	.72	.65	.307	11	.44	.68	.605	11	.77	.58	1.430	9	.96	.65	1.447
EXP-22	9	-.58	1.08	-2.457*	9	.68	.90	1.094	9	.12	.64	-1.038	9	.70	.73	.458
EXP-23	8	.30	.34	-1.004	8	.85	.85	1.563	8	.43	.70	.039	6	1.38	.67	2.813*
TOTAL EXPER.	40	.27	.86	-1.049	40	.63	.74	1.349	40	.47	.54	.269	36	1.03	.65	1.928
CONTROL	8	.61	.75		8	.25	.55		8	.41	.41		8	.56	.33	

NOTE: * p = .05

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TABLE 2a

COMPUTER-ASSISTED INSTRUCTION IN DRILL-AND-PRACTICE MATHEMATICS

COMPREHENSIVE TEST OF BASIC SKILLS

CHANGE (in months)	EXPERIMENTAL GROUP		CONTROL GROUP	
	f	%	f	%
Less than or equal 3 months	6	16.7	2	25.0
4 "	2	5.6	2	25.0
5 "	1	2.8		
6 "			1	12.5
7 "			1	12.5
8 "	2	5.6		
9 "	3	8.3	1	12.5
10 "	2	5.6		
11 "	7	19.4	1	12.5
12 "	3	8.3		
13 "	3	8.3		
14 "				
15 "				
16 "	2	5.6		
17 "	1	2.8		
18 "				
19 "				
20 "				
21 "	3	8.3		
22 "				
23 "				
24 "				
25 "				
26 "				
27 "	1	2.8		
	36	100.1	8	100.0

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TABLE 2b

CALIFORNIA ARITHMETIC TEST

REASONING SUBTEST

CHANGE (in months)	EXPERIMENTAL GROUP		CONTROL GROUP	
	f	%	f	%
Less than or equal 3 months	19	47.5%	3	37.5%
4 "	2	5.0		
5 "	3	7.5	1	12.5
6 "	2	5.0	1	12.5
7 "	4	10.0		
8 "	2	5.0	1	12.5
9 "	2	5.0		
10 "				
11 "				
12 "	1	2.5		
13 "	2	5.0		
14 "	2	5.0		
15 "			1	12.5
16 "				
17 "				
18 "	1	2.5	1	12.5
	40	100.0	8	100.0

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TABLE 2c

CALIFORNIA ARITHMETIC TEST

FINDAMENTALS SUBTEST

CHANGE (in months)	EXPERIMENTAL GROUP		CONTROL GROUP	
	F	%	F	%
Less than or equal 3 months	11	27.5%	4	50.0%
4 "	1	2.5	1	12.5
5 "	5	12.5		
6 "	4	10.0	1	12.5
7 "	4	10.0		
8 "			1	12.5
9 "				
10 "	3	7.5	1	12.5
11 "				
12 "	3	7.5		
13 "	3	7.5		
14 "				
15 "	3	7.5		
16 "				
17 "	1	2.5		
18 "	1	2.5		
19 "				
20 "	1	2.5		
	40	100.0	8	100.0

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TABLE 2d

CALIFORNIA ARITHMETIC TEST

TOTAL AVERAGE

CHANGE (in months)	EXPERIMENTAL GROUP		CONTROL GROUP	
	f	%	f	%
Less than or equal 3 months	12	30.0%	4	50.0%
4 "	5	12.5	1	12.5
5 "	3	7.5	1	12.5
6 "	4	10.0		
7 "	1	2.5	1	12.5
8 "	4	10.0		
9 "	3	7.5		
10 "	5	12.5		
11 "	2	5.0		
12 "	1	2.5	1	12.5
	40	100.0	8	100.0

MARY E. BRAGG - ABC

5th Grade
Computer Math Students

TABLE 3

CTBS - Jan. 1 - March 23, 1973

	Oct. 1972				Feb. 1973				Gain - Loss			
Students	Comp.	Concept	Appli.	Total	Comp.	Concept	Appli.	Total	Comp.	Concept	Appli.	Total
1	6.1	6.7	5.6	6.2	6.3	7.6	7.0	6.9	+ 2	+ 9	+ 8	+ 7
2	___	___	___	___	6.3	7.1	7.0	6.8	___	___	___	___
3	6.6	6.7	8.5	7.1	8.2	8.2	7.6	8.0	+1.6	+1.5	- .9	+ .9
4	6.6	8.8	7.0	7.5	5.6	7.6	7.6	6.5	-1.0	-1.2	+ .6	-1.0
5	5.0	5.3	4.3	5.0	6.1	5.9	5.6	5.9	+1.1	+ .6	+1.3	+ .9
6	___	___	___	___	7.1	8.8	7.6	7.8	___	___	___	___
7	5.4	6.7	5.6	5.8	6.6	6.7	7.6	7.0	+1.2	+ .0	+2.0	+1.2
8	5.6	6.3	7.0	6.1	7.1	8.8	6.0	7.3	+1.5	+2.5	+1.0	+1.2
9	4.8	4.7	5.0	4.8	5.3	4.2	2.6	4.6	+ .5	- .5	-2.4	- .2
10	5.4	5.1	6.0	5.4	6.6	7.1	5.0	6.3	+1.2	+2.0	-1.0	+ .9
11	7.1	8.1	5.3	6.8	6.1	8.1	7.6	7.1	-1.0	+ .0	+2.5	+ .3
12	6.3	9.4	9.4	8.0	8.1	7.6	11.5	8.7	+1.5	-1.8	+2.1	+ .7
13	5.7	5.1	5.3	5.4	5.3	5.6	6.5	5.6	+ .4	- .5	+1.2	+ .2
14	2.9	7.1	5.6	6.2	5.7	8.1	6.0	6.4	- .2	+1.0	+ .4	+ .2
15	4.7	4.0	3.4	4.3	7.1	6.3	11.1	7.5	+2.4	+2.3	+7.7	+3.2
16	6.6	7.1	8.5	7.3	9.3	8.8	7.0	8.5	+2.7	+1.7	-1.5	+1.2
17	5.6	7.6	5.3	6.2	7.1	5.3	6.5	6.3	+1.5	-1.7	+1.2	+ .1
18	5.4	4.2	2.1	4.6	5.6	6.3	5.3	5.7	+ .2	+2.1	+3.2	+1.1
19	5.3	6.3	5.3	5.5	8.7	7.1	7.0	7.6	+3.4	+ .7	+1.7	+2.1
20	___	___	___	___	7.6	8.1	8.5	8.0	___	___	___	___
21	5.9	7.6	5.0	6.1	7.1	7.6	8.5	7.6	+1.2	+ .0	+3.5	+1.5

MARY E. BRAGG - ABC

TABLE 3 (cont.)

5th Grade
Computer Math Students

CTBS - Jan. 1 - March 23, 1973

Students	Oct. 1972 Comp.	Concept	Appli.	Total	Feb. 1973 Comp.	Concept	Appli.	Total	Gain - Loss Comp.	Concept	Appli.	Total
22	4.4	4.5	3.8	4.3	5.7	5.7	5.3	5.6	+1.3	+1.2	+1.5	+1.3
23	5.9	7.1	9.4	6.9	6.1	8.8	9.4	7.6	+ .2	+1.7	+ .0	+ .7
24	7.6	8.8	6.5	7.6	8.1	6.7	9.4	7.8	+ .5	-2.1	+2.9	+ .2
25	7.1	8.8	7.0	7.6	8.1	9.4	7.6	8.5	+1.0	+ .6	+ .6	+ .9
26	6.1	6.3	8.5	6.6	6.3	8.1	7.6	7.3	+ .2	+1.8	- .9	+ .7
27	—	—	—	—	7.1	8.1	8.5	7.8	—	—	—	—
28	5.0	5.6	3.8	4.9	5.6	7.1	4.1	5.5	+ .6	+1.5	+ .3	+ .6
29	5.9	5.3	3.8	5.2	5.6	6.7	3.8	5.4	+ .3	+1.4	+ .0	+ .2
30	6.3	7.6	7.6	7.1	8.1	7.6	8.5	8.0	+1.8	+ .0	+ .9	+ .9
						Gain			.9	.6	.7	.76 .8

MARY E. BRAGG - ABC

4th Grade

TABLE 4

Computer Math Students

CTBS - Oct. 1 - Dec. 30, 1972

	Oct. 1972				Feb. 1973				Gain - Loss			
Students	Comp.	Concept	Appli.	Total	Comp.	Concept	Appli.	Total	Comp.	Concept	Appli.	Total
1	4.6	4.5	3.8	4.4	5.4	5.3	5.3	5.4	+ .8	+ .8	+1.5	+1.0
2	6.6	5.6	7.0	6.4	7.1	8.1	7.6	7.6	+ .5	+2.5	+ .6	+1.2
3	5.4	6.3	6.0	5.8	6.3	7.1	6.5	6.9	+ .9	+ .8	+ .5	+1.1
4	4.8	4.2	3.8	4.5	5.7	7.1	6.5	6.3	+ .9	+2.9	+2.7	+1.8
5	5.2	4.9	6.0	5.2	5.9	7.6	5.6	6.3	+ .7	+2.7	- .4	+1.1
6	4.7	4.9	3.0	4.5	6.1	8.8	5.6	6.6	+1.4	+3.9	+2.6	+2.1
7	3.3	3.0	2.6	3.0	5.7	5.9	4.3	5.4	+2.4	+2.9	+1.7	+2.4
8	5.0	4.0	3.4	4.5	5.4	5.3	3.8	5.1	+ .4	+1.3	+ .4	+ .6
9	5.2	3.2	2.6	4.2	6.3	6.3	6.5	6.4	+1.1	+3.1	+3.9	+2.2
10	5.2	4.7	5.0	5.0	6.6	7.6	6.0	6.8	+1.4	+2.9	+1.0	+1.8
11	4.6	5.6	8.5	5.3	6.3	8.1	7.6	7.3	+1.7	+2.5	- .9	+2.0
12	___	___	___	___	6.3	5.9	5.3	5.9	___	___	___	___
13	5.6	4.2	3.8	4.8	6.6	5.1	5.0	5.7	+1.0	+ .9	+1.2	+ .9
14	4.8	5.3	9.4	5.5	7.6	9.4	8.5	8.5	+2.8	+4.1	- .9	+3.0
15	5.0	5.6	3.0	4.8	5.7	9.4	7.6	7.1	+ .7	+3.8	+4.6	+2.3
16	5.2	4.5	4.3	4.8	5.4	6.3	6.0	5.8	+ .2	+1.8	+1.7	+1.0
17	5.3	2.8	2.1	4.1	5.4	4.5	4.1	4.9	- .1	+1.7	+2.1	+ .8
18	4.2	5.6	7.0	4.9	5.5	7.6	5.6	6.1	+1.3	+2.0	+1.4	+1.2
19	5.7	5.1	4.6	5.3	5.6	7.1	5.3	5.9	- .1	+2.0	+ .7	+ .6
20	4.3	4.5	5.0	4.5	4.7	4.2	5.6	4.8	+ .4	+ .3	+ .6	+ .3
						Gain			+ .9	2.25	1.3	1.44

WILL ROGERS SCHOOL - BELLFLOWER

TABLE 5

Tally Sheet

November 2, 1972 - December 1, 1972

Months Achievement Gain	Tally	Number of Students
- 4	II	2
- 3		
- 2	I	1
- 1		
0	III	3
1	𝍸 IIII	9
2	𝍸 𝍸 II	12 Mode
3	𝍸 𝍸 I	11
4	𝍸 IIII	9
5	𝍸 I	6
6	II	2
7	I	1
8		
9	I	1
10		
11		
12		
13		
14	II	2
		59

WILL ROGERS SCHOOL - BELLFLOWER

TABLE 6

November 2, 1972 - December 1, 1972

No.	Name	Grade	Achievement 2 Nov.	1 Dec.	Gain	Sessions	Net Sessions
1		5	3.1	3.5	4	9-25	16
2		5	2.0	2.3	3	11-23	12
3		4	2.0	2.2	2	10-27	17
4		4	2.0	2.1	1	8-21	13
5		4	2.0	2.4	4	9-24	15
6		4	3.0	3.4	4	9-19	10
7		5	2.0	2.3	3	11-23	12
8		5	3.5	3.1	-4	1-16	15
9		4	1.7	2.0	3	9-20	11
10		5	3.5	3.5	0	2-21	19
11		4	2.1	2.4	3	10-26	16
12		5	2.5	3.9	14	7-17	10
13		4	2.5	3.0	5	10-27	17
14		4	2.1	2.4	3	10-22	12
15		4	3.0	3.6	6	8-24	16
16		4	2.7	3.4	7	8-27	19
17		4	2.2	2.4	2	10-18	8
18		4	3.0	3.4	4	10-25	15
19		4	3.0	3.2	2	8-16	8
20		4	3.5	3.6	1	10-20	10
21		4	2.5	3.0	5	6-21	15
22		6	5.5	5.3	-2	1-15	14
23		5	3.5	3.8	3	12-27	15
24		6	4.0	4.2	2	12-25	13
25		6	3.5	3.7	2	8-18	10
26		6	4.5	4.7	2	10-22	12
27		6	2.6	3.0	4	7-21	14
28		6	4.0	4.1	1	10-23	13
29		6	4.0	4.1	1	15-30	15
30		6	4.5	4.8	3	12-28	16
31		6	2.6	3.2	6	13-29	16
32		6	3.5	3.6	1	11-22	11
33		6	4.7	5.0	3	12-22	10
34		6	3.5	3.7	2	12-25	13
35		5	3.6	3.8	2	13-23	10
36		6	2.5	2.8	3	8-23	15
37		6	2.0	2.5	5	10-25	15
38		6	4.3	4.4	1	15-30	15
39		6	3.5	3.6	1	10-21	11
40		5	2.0	2.1	1	6-15	9
41		6	3.5	3.9	4	10-27	17
42		6	4.6	5.0	4	9-23	14

WILL ROGERS SCHOOL - BELLFLOWER

TABLE 6 (Con't)

November 2, 1972 - December 1, 1972

No.	Name	Grade	Achievement 2 Nov.	1 Dec.	Gain	Sessions	Net Sessions
	43	5	2.6	4.0	14	12-23	11
	44	6	5.2	5.7	5	10-24	14
	45	6	2.5	2.7	2	5-18	13
	46	5	2.6	3.1	5	10-25	15
	47	4	1.9	1.9	0	8-22	14
	48	4	2.1	2.6	5	10-24	14
	49	4	1.7	2.1	4	8-19	11
	50	4	2.0	2.2	2	11-28	17
	51	4	2.0	2.2	2	8-24	16
	52	4	2.0	2.9	9	7-24	17
	53	4	1.7	2.1	4	8-23	15
	54	4	2.0	2.2	2	9-25	16
	55	4	2.5	2.8	3	9-24	15
	56	6	3.0	3.0	0	7-16	9
	57	6	5.1	5.4	3	11-23	12
	58	6	3.4	3.5	1	9-24	15
	59	5	2.5	2.1	-4	7-16	9

WILL ROGERS SCHOOL - BELLFLOWER

TABLE 7

Tally Sheet

January 3, 1973 - January 31, 1973

Months Achievement Gain	Tally	Number of Students
0	///	3
1	𝍸 𝍸 𝍸	15 Mode
2	𝍸 𝍸 //	12
3	𝍸 𝍸 ///	13
4	𝍸 /	6
5	//	2
6	//	2
		53

WILL ROGERS SCHOOL - BELLFLOWER

TABLE 8

January 3, 1973 - January 31, 1973

No.	Name	Grade	Achievement 3 Jan.	Achievement 31 Jan.	Gain	Sessions	Net Sessions
	1	5	3.7	4.0	3	35-50	15
	2	5	2.6	2.9	3	35-53	18
	3	4	2.5	2.9	4	39-54	15
	4	4	2.4	2.9	4	29-43	14
	5	4	2.5	2.9	4	34-50	16
	6	4	3.5	3.6	1	28-43	15
	7	5	2.5	2.8	3	35-51	16
	8	5	3.4	3.6	2	28-47	19
	9	4	2.2	2.4	2	28-41	13
	10	5	3.5	3.8	3	31-47	16
	11	4	2.7	3.0	3	37-50	13
	12	5	3.9	4.0	1	27-40	13
	13	4	3.3	3.5	2	37-53	16
	14	4	2.7	3.1	4	33-46	13
	15	4	3.7	4.0	3	35-52	17
	16	4	3.5	3.8	3	39-57	18
	17	4	2.6	2.8	2	29-38	9
	18	4	3.6	4.0	4	37-55	18
	19	4	3.4	3.6	2	26-41	15
	20	4	3.8	4.0	2	30-45	15
	21	4	3.5	3.6	1	32-46	14
	22	6	5.6	5.9	3	26-44	18
	23	5	3.8	4.0	2	32-43	11
	24	6	4.3	4.4	1	32-45	13
	25	6	3.9	4.1	2	30-42	12
	26	6	4.7	4.7	0	31-45	14
	27	6	3.4	3.7	3	31-47	16
	28	6	4.1	4.2	1	31-45	14
	29	6	4.1	4.1	0	36-44	18
	30	6	4.8	5.0	2	40-56	16
	31	6	3.5	3.6	1	35-44	9
	32	6	3.6	3.7	1	36-44	8
	33	6	5.1	5.2	1	31-44	13
	34	6	3.7	3.7	0	31-44	13
	35	5	3.9	4.0	1	31-44	13
	36	6	3.1	3.3	2	34-43	9
	37	6	2.8	3.2	4	31-44	13
	38	6	4.7	4.8	1	39-54	15
	39	6	3.8	4.0	2	31-43	12
	40	6	2.2	2.3	1	26-40	14
	41	6	4.2	4.8	6	38-56	18
	42	6	5.2	5.5	3	31-43	12

WILL ROGERS SCHOOL - BELLFLOWER

TABLE 8 (Con't)

January 3, 1973 - January 31, 1973

No.	Name	Grade	Achievement 3 Jan.	Achievement 31 Jan.	Gain	Sessions	Net Sessions
	43	5	3.9	4.0	1	30-46	16
	44	6	5.8	6.3	5	31-45	14
	45	6	2.9	3.0	1	28-42	14
	46	5	3.3	3.4	1	33-39	6
	47	4	2.0	2.2	2	32-38	6
	48	4	2.9	3.5	6	34-52	18
	49	4	2.4	2.9	5	29-42	13
	50	4	2.4	2.5	1	39-57	18
	51	4	2.4	2.7	3	35-52	17
	52	4	3.2	3.5	3	33-49	16
	53	4	2.3	2.6	3	34-51	17

WILL ROGERS SCHOOL - BELLFLOWER

TABLE 9

Tally Sheet

November 2, 1972 - January 31, 1973

Months Achievement Gain	Tally	Number of Students	
1	///	3	
2	////	4	
3	//	2	
4	//	2	
5	/// ///	8	Mode
6	///	5	
7	//	2	Median
8	//	2	
9	/// ///	8	Mode
10	///	5	
11	////	4	
12	//	2	
13	//	2	
14	//	2	
15	//	2	
		53	

WILL ROGERS SCHOOL - BELLFLOWER

TABLE 10

November 2, 1972 - January 31, 1973

No.	Name	Grade	Achievement 2 Nov.	Achievement 31 Jan.	Gain	Sessions	Net Sessions
	1	5	3.1	4.0	9	9-50	41
	2	5	2.0	2.9	9	11-53	42
	3	4	2.0	2.9	9	10-54	44
	4	4	2.0	2.9	9	8-43	35
	5	4	2.0	2.9	9	9-50	41
	6	4	3.0	3.6	6	9-43	34
	7	5	2.0	2.8	8	3-51	18
	8	5	3.5	3.6	1	1-47	46
	9	4	1.7	2.4	7	9-41	32
	10	5	3.5	3.8	3	2-47	45
	11	4	2.1	3.0	9	10-50	40
	12	5	2.5	4.0	15	7-40	33
	13	4	2.5	3.5	10	10-53	43
	14	4	2.1	3.1	10	10-46	36
	15	4	3.0	4.0	10	8-52	44
	16	4	2.7	3.8	11	8-57	49
	17	4	2.2	2.8	6	10-38	28
	18	4	3.0	4.0	10	10-55	45
	19	4	3.0	3.6	6	8-41	33
	20	4	3.5	4.0	5	10-45	35
	21	4	2.5	3.6	11	6-46	40
	22	6	5.3	5.9	6	1-44	43
	23	5	3.5	4.0	5	12-43	31
	24	6	4.0	4.4	4	12-45	33
	25	6	3.5	4.1	6	8-42	34
	26	6	4.5	4.7	2	10-45	35
	27	6	2.6	3.7	11	7-47	40
	28	6	4.0	4.2	2	10-45	35
	29	6	4.0	4.1	1	15-44	29
	30	6	4.5	5.0	5	12-56	44
	31	6	2.6	3.6	10	13-44	31
	32	6	3.5	3.7	2	11-44	33
	33	6	4.7	5.2	5	12-44	32
	34	6	3.5	3.7	2	12-44	32
	35	5	3.6	4.0	4	13-44	31
	36	6	2.0	3.3	13	6-43	37
	37	6	2.0	3.2	12	10-44	34
	38	6	4.3	4.8	5	15-54	39
	39	6	3.5	4.0	5	10-43	33
	40	6	2.0	2.3	3	6-40	34
	41	6	3.5	4.8	13	10-56	46
	42	6	4.6	5.5	9	9-43	34

WILL ROGERS SCHOOL - BELLFLOWER

TABLE 10 (Con't)

November 2, 1972 - January 31, 1973

No.	Name	Grade	Achievement 2 Nov.	Achievement 31 Jan.	Gain	Sessions	Net Sessions
	43	5	2.6	4.0	14	12-46	34
	44	6	5.2	6.3	11	10-45	35
	45	6	2.5	3.0	5	5-42	37
	46	5	2.6	3.4	8	10-39	29
	47	4	1.9	2.2	3	8-38	30
	48	4	2.1	3.5	14	10-52	42
	49	4	1.7	2.9	12	8-42	34
	50	4	2.0	2.5	5	11-57	46
	51	4	2.0	2.7	7	8-52	44
	52	4	2.0	3.5	15	7-49	42
	53	4	1.7	2.6	9	8-51	43